

Corrections were found for the excentricity of the Earth's orbit and for the place of perihelion.

A correction was found for the epoch of Sun's longitude; and this correction led to a result of some importance. The comparison of this with similar corrections found by Burckhardt for other epochs convinced me that there was an unrecognised inequality in the Sun's longitude, and finally led to the discovery of the equation of long period in the motions of the Earth and *Venus*.

To these results applying to the movable bodies of the solar system, I may add one which affects the honour of the Royal Observatory as maintained by my predecessor, Mr. Pond, that the whole train of the investigations testifies strongly to the excellence of the transit observations made sixty years ago, which appear to have been as good as those of the present day.

1878, November 16.

On the Conjunction of Mars and Saturn, 1879, June 30.

By Sir G. B. Airy, Astronomer Royal.

On 1879, June 30, will occur a conjunction of *Mars* and *Saturn* of unusual interest. Adopting the elements of the *Nautical Almanac*, Mr. Dunkin, at my request, has computed the geocentric places of the centres of the two planets for every hour—and through the greater part of the time for every quarter-hour—from June 30, 2^h to 20^h. The results for every quarter-hour, from 6^h to 9^h Greenwich Mean Solar Time, are laid down in a chart, which I have the pleasure of submitting to the Society. The small movements of *Saturn* are there applied, in opposite directions, to the true movements of *Mars*; so that, with a fixed representation of *Saturn*, the relative position of *Mars* is correctly given for each of those times. The magnitudes of the two planets and the position of *Saturn's* ring are accurately represented, the lower line of the chart being parallel to the Equator.

It will be seen that the nearest approach of the two planets occurs at 7^h 30^m nearly, and that the distance between their centres is then 1' 12". These numbers will be affected by the possible errors of the planetary tables.

In the table which accompanies the chart Mr. Dunkin has given the local times at Vienna, the Cape of Good Hope, Madras, Sydney, San Francisco, and Cordoba (Argentine Confederation), corresponding to the Greenwich hours above mentioned. (These stations are selected as giving a chain of longitudes proceeding easterly round the Earth, with some range of latitude.) The local times of planet-rise and sunrise are also given, as limiting the times of observation. It is mortifying to us to remark that the planets cannot be seen at their closest proximity in Europe

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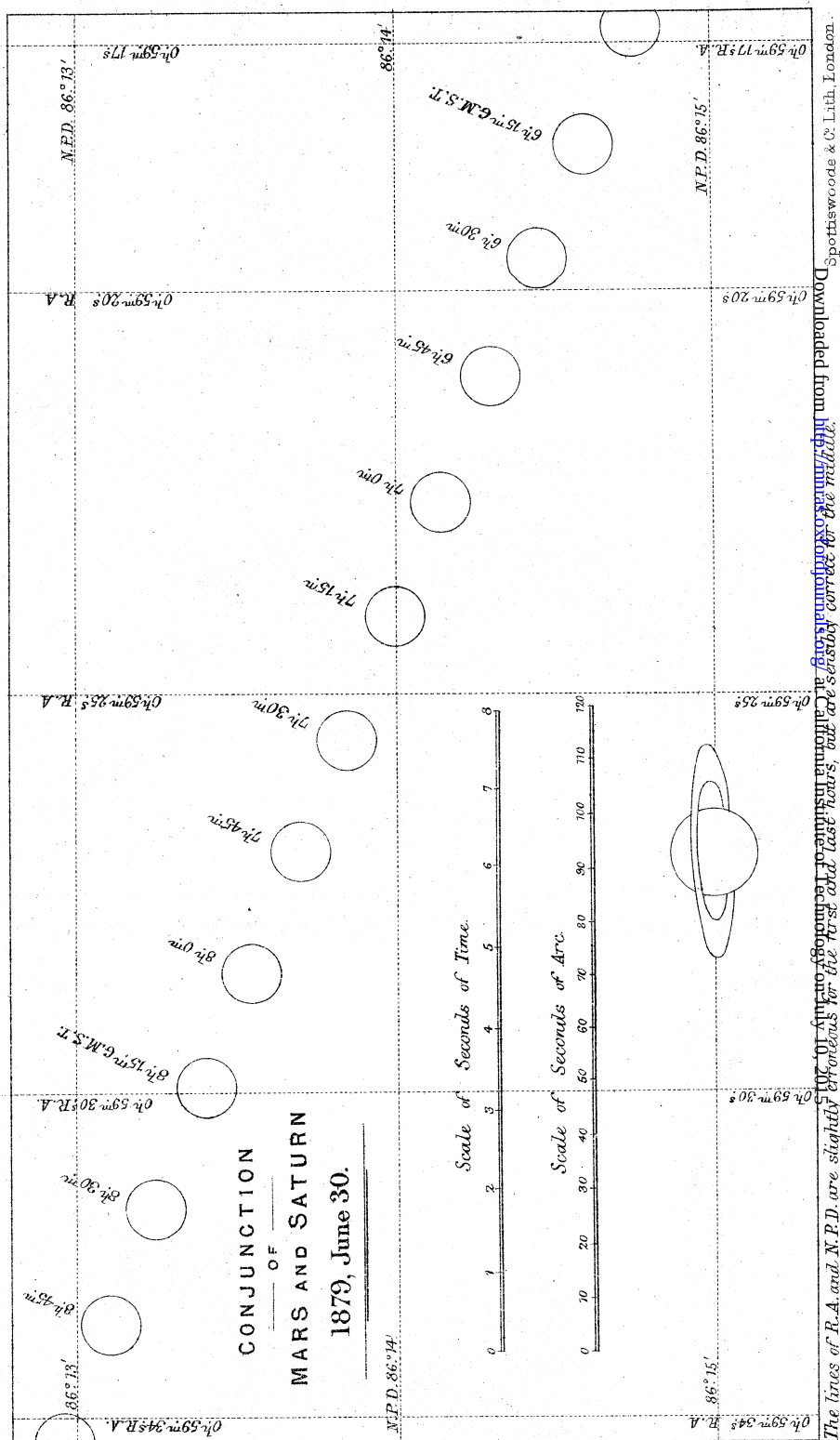
or Africa. For us the smallest interval will be about 9'. This, however, is less than the smallest interval at the conjunction of 1877, November 3. In India and Australia the conjunction will be seen extremely well. But no part of the near approach can be seen in America.

Different observers will make use of this phenomenon for different purposes. The instrumental measurement of the relative positions of the planets will give a test of Leverrier's Tables in parts of their orbits where it could not otherwise be obtained. I look with much interest to observations of the colours of the two planets. At the conjunction of 1877, November 3, the distance between the planets rendered it impossible to see them in the same field with a high power on the telescope, and therefore impossible to receive from them any large pencil of light. I did myself observe them with a good surveyor's hand-telescope, and was much struck with the result as to their colours. While *Mars* had his usual fiery yellow-red colour, *Saturn* was of deep sap-green. How much of this colour was due to contrast with the predominant blaze of *Mars* I cannot judge. In the approaching conjunction *Mars* will be much smaller, and the colours can perhaps be compared more justly.

I am permitted by Mr. Marth to state, as the result of his calculations of the places of the satellites of *Saturn*, that *Mars* will apparently pass through some of their orbits, and in particular will probably be within 30'' of *Japetus*. The nearest approach, however, will occur between 2^h and 3^h Greenwich Mean Solar Time, and probably can only be seen in some of the islands of the Pacific, as the Sandwich Islands or the Society Islands.

Mr. Marth also remarks that the position angle of the greatest defect of illumination of the disk of *Mars* on June 30, at 8^h, is 247°·08, and the greatest defect of illumination is 0·159 × diameter of the planet, or 1''·4, assuming the diameter as 8''·8.

Royal Observatory, Greenwich,
1878, December 7.



Distances between the Centres of Mars and Saturn near their Conjunction on 1879, June 30, for Local Times at Greenwich and seven other Observatories.

Local Mean Solar Time at												Distance of Centres of Planets. ' " 8 25 6 53 5 22 3 51 3 10 2 30 1 54 1 37 1 24 1 15 1 12 1 17 1 27 1 43												
Greenwich.			Vienna.			Cape of Good Hope.			Madras.				Sydney.			San Francisco.			Washington.			Cordoba.		
June	d	h m	June	d	h m	June	d	h m	June	d	h m		June	d	h m	June	d	h m	June	d	h m	June	d	h m
30	2 0	3 6	30	3 6	3 14	30	7 21	3 0	30	12 5	30		13 5	29	19 4	29	20 52	29	21 44	29	21 44	29	21 44	29
3 0		4 6		4 6	4 14		8 21		8 21	13 5		13 5		20 4		21 52		22 44		22 44		22 44		22 44
4 0		5 6		5 6	5 14		9 21		9 21	14 5		14 5		21 4		22 52		23 44		23 44		23 44		23 44
5 0		6 6		6 6	6 14		10 21		10 21	15 5		15 5		22 4		23 52		0 44		0 44		0 44		0 44
5 30		6 36		6 36	6 44		10 51		10 51	15 35		15 35		22 34		0 22		1 14		1 14		1 14		1 14
6 0		7 6		7 6	7 14		11 21		11 21	16 5		16 5		23 4		0 52		1 44		1 44		1 44		1 44
6 30		7 36		7 36	7 44		11 51		11 51	16 35		16 35		23 34		1 22		2 14		2 14		2 14		2 14
6 45		7 51		7 51	7 59		12 6		12 6	16 50		16 50		29 23 49		1 37		2 29		2 29		2 29		2 29
7 0		8 6		8 6	8 14		12 21		12 21	17 5		17 5		30 0 4		1 52		2 44		2 44		2 44		2 44
7 15		8 21		8 21	8 29		12 36		12 36	17 20		17 20		0 19		2 7		2 59		2 59		2 59		2 59
7 30		8 36		8 36	8 44		12 51		12 51	17 35		17 35		0 34		2 22		3 14		3 14		3 14		3 14
7 45		8 51		8 51	8 59		13 6		13 6	17 50		17 50		0 49		2 37		3 29		3 29		3 29		3 29
8 0		9 6		9 6	9 14		13 21		13 21	18 5		18 5		1 4		2 52		3 44		3 44		3 44		3 44
8 15		9 21		9 21	9 29		13 36		13 36	18 20		18 20		1 19		3 7		3 59		3 59		3 59		3 59

Distances between the centres of Mars and Saturn near their conjunction on 1879, June 30, for Local Times at Greenwich and seven other Observatories—continued.

Local Mean Solar Time at																		Distance of Centres of Planets.						
Greenwich.			Vienna.			Cape of Good Hope.			Madras.			Sydney.			San Francisco.				Washington.			Cordoba.		
June	d	h m	June	d	h m	June	d	h m	June	d	h m	June	d	h m	June	d	h m	June	d	h m	June	d	h m	
30	8	30	30	9	36	30	9	44	30	13	51	30	18	35	30	1	34	30	3	22	30	4	14	2 3
8 45			9 51			9 59			14 6			18 50			1 49			3 37			4 29			2 24
9 0			10 6			10 14			14 21			19 5			2 4			3 52			4 44			2 45
9 15			10 21			10 29			14 36			19 20			2 19			4 7			4 59			3 7
9 30			10 36			10 44			14 51			19 35			2 34			4 22			5 14			3 30
9 45			10 51			10 59			15 6			19 50			2 49			4 37			5 29			3 53
10 0			11 6			11 14			15 21			20 5			3 4			4 52			5 44			4 16
10 30			11 36			11 44			15 51			20 35			3 34			5 22			6 14			4 59
11 0			12 6			12 14			16 21			21 5			4 4			5 52			6 44			5 43
11 30			12 36			12 44			16 51			21 35			4 34			6 22			7 14			6 27
12 0			13 6			13 14			17 21			22 5			5 4			6 52			7 44			7 11
13 0			14 6			14 14			18 21			30 23 5		July	6 4			7 52			8 44			8 43
14 0			15 6			15 14			19 21			1 0 5			7 4			8 52			9 44			10 18

15 0	16 6	16 14	20 21	1 5	8 4	9 52	10 44	11 52
16 0	17 6	17 14	21 21	2 5	9 4	10 52	11 44	13 27
17 0	18 6	18 14	22 21	3 5	10 4	11 52	12 44	15 2
18 0	19 6	19 14	30 23 21	4 5	11 4	12 52	13 44	16 37
July								
19 0	20 6	20 14	1 0 21	5 5	12 4	13 52	14 44	18 12
30 20 0	30 21 6	30 21 14	1 1 21	1 6 5	30 13 4	30 14 52	30 15 44	19 48

Local Mean Solar Time of Planet-rise.

30 12 5	30 12 7	30 12 34	30 12 23	30 12 32	30 12 13	30 12 13	30 12 34
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Local Mean Solar Time of Sunrise.

30 15 53	30 16 9	30 19 10	30 17 40	30 19 10	30 16 45	30 16 42	30 19 4
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